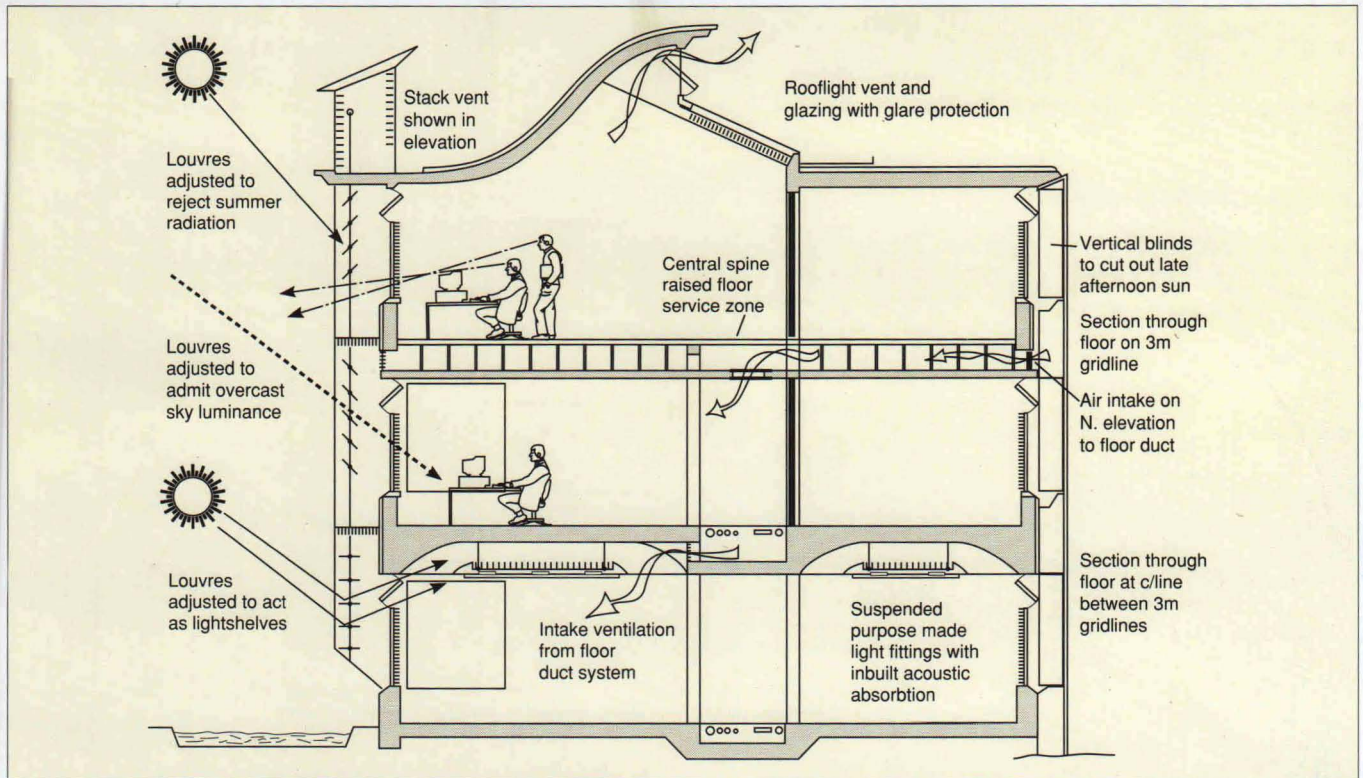


The energy efficient office of the future



Preliminary sketch - typical section

Project objectives

- To encourage progress towards an office building which will satisfy both the energy and the environmental targets of the early part of the 21st century
- To stimulate, earlier than might otherwise have been the case, the development of new technologies, products and systems for low energy design
- To produce a Performance Specification and to apply this to the design and construction of an exemplar 'host' office
- To monitor and analyse the design process, and to carry out a minimum of 18 months monitoring of the building in use
- To disseminate the results and to promote the host building throughout the construction industry as an energy efficient office of the future (EOF)

Potential audience

Property developers, architects, engineers, owners and occupiers.

Project summary

BRECSU, on behalf of the Energy Efficiency Office (EEO), has initiated the EOF project to encourage the development of energy efficient solutions to likely future changes in office requirements. The last few decades have seen significant changes in office design because of improvements in technology, increased environmental concerns, changes in legislation, and user demands for higher quality and more flexible working environments.

In order to examine the impact of these and future changes, the EOF project has brought together a number of commercial companies and large organisations to represent designers, fuel utilities, installers, manufacturers and property developers. See box (right).

The current membership of the EOF Group is:

Arup Research and Development
British Gas
Building Research Establishment
Caradon Trend
Colt Group
Eastern Electricity
Electricity Association
Hepworth Building Products
Laing Technology Group
Philips Lighting
Pilkington Glass
Stanhope Properties Plc



Energy Efficiency Office
DEPARTMENT OF THE ENVIRONMENT

“To encourage the development of energy efficient solutions to likely future developments in office requirements”

Building type	Energy consumption (kWh/m ²)	Annual greenhouse gas emission (CO ₂ kg/m ²)
Narrow plan, gas and electric	Electricity 36 Gas 47	34
Narrow plan, all electric	Electricity 68	46
Deep plan, gas and electric	Electricity 43 Gas 47	39
Deep plan, all electric	Electricity 75	51

Table 1 Energy consumption targets

Regular forum meetings of the EOF Group have led to the production of a Performance Specification. The Specification is not a design guide. Its function is to focus the minds of building clients and their design teams on energy issues and to provide a check list of things to consider from the earliest stages of a building design. Its emphasis is on energy use rather than broader environmental issues as these are already dealt with by the BRE Environmental Assessment Method (BREEAM)¹.

The Performance Specification gives a series of performance targets for energy consumption and carbon dioxide emissions per unit of floor area. These are given for both narrow and deep plan buildings, and for gas and electricity use. The targets are based upon a 30% improvement in current best practice and are further split into end use to allow a realistic building evaluation to be undertaken. The targets will need to be adjusted for a specific building, eg to take into account a main frame computer or heavy catering loads. Table 1 reproduces the targets for total annual energy consumption and corresponding carbon dioxide emissions. The target is shown in figure 1 compared with measured data for offices representing current good practice.

To achieve a significant reduction in energy use there are four main areas for improvement:

- avoiding or minimising the use of air-conditioning
- minimising the use of artificial lighting whilst actively exploiting daylighting
- maximising the benefits of the building fabric by reducing or smoothing heating or cooling loads
- using the appropriate level of controls.

However, energy efficiency has only been achieved when the resultant design leads to a comfortable and healthy working environment. The Performance Specification therefore also considers thermal, visual and aural comfort, environmental and health issues, and indoor air quality.

Effective use of the building is a vital accompaniment to low energy design in achieving the required energy consumption targets. Therefore building automation, maintenance and management are also covered by the performance specification.

The host building

The first EOF building will be designed, built and monitored utilising input in the form of products and ideas from the EOF Group (in support of the client's own design team). An overriding concern is that the EOF be replicable. This means that the building must have a total cost-in-use (ie construction, running and maintenance costs) totalling no more than a conventional low energy office. As this is an office for the future it is recognised that certain products, not yet being widely available in the market place, will be more expensive than conventional ones. In cases such as these, the products will be subsidised by the relevant Group members. Even so, for a product or technique to be employed it must be apparent that its future costs will fall to an acceptable level as it proceeds beyond the prototype stage.

Following an extensive search of the market place to find a suitable host building, the new office block being constructed at the Building Research Establishment site at Garston has been chosen. A fortunate combination of location, timing, and an environmentally aware client, has afforded a unique opportunity to become involved with this building.

Design work began in the autumn of 1994, with a start on site in autumn 1995. Completion is due in autumn 1996. The approximate floor size is 2000 m², with some space set aside for seminar rooms.

Post-occupancy monitoring will be undertaken on behalf of the Energy Efficiency Office and the EOF Group under the Best Practice programme. The operation of the new building will also be of relevance to the research being carried out by BRE for the DOE's Construction Sponsorship Directorate. The EOF project is also interested in the design process surrounding this building and will be paying particular attention to the way in which decisions affecting energy consumption are taken.

This building will command a high profile as an exemplar office demonstrating both energy efficiency and architectural merit. It is intended that it will become a flagship building for the EOF project, for BRE, and for the UK construction industry.

Further details of the project will be published in the technical press as it progresses.

Target savings

The project is expected to lead initially to energy savings worth £6 million/year by the year 2010, equivalent to CO₂ savings of 7500 tonnes/annum.

References

1. BREEAM – Building Research Establishment Environmental Assessment Method. Version 1/93 BREEAM/New Offices.
2. Energy Consumption Guide 19 – Energy efficiency in offices: A technical guide for owners and single tenants.

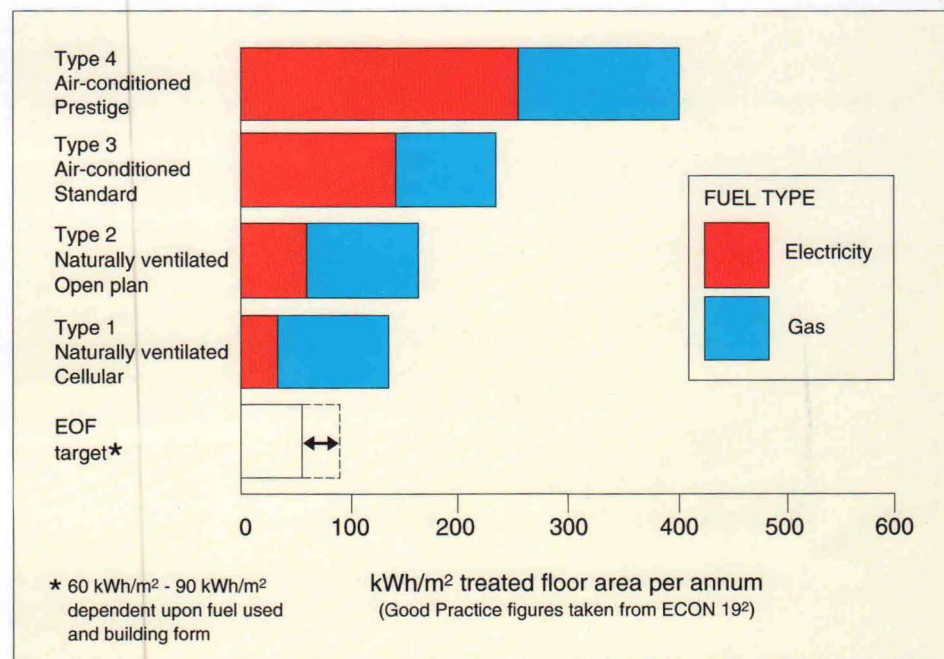


Figure 1 Energy consumption of good practice offices and the EOF